Remarks

Claims 1 - 32 are pending in the application. These claims were rejected as follows:

Claims / Section	35 U.S.C. Sec.	References / Notes
1 – 5, 8, 13 – 18, 26	§102(b) Anticipation	• Furcht, et al. (U.S. Patent No. 6,054,277).
26	§102(b) Anticipation	• Thundat, et al. (U.S. Patent No. 6,289,717).
1 – 5, 7, 8, 13 – 18	§102(e) Anticipation	• Welland, et al. (U.S. Patent Pub. No. 2003/0222232).
1 – 8, 12 – 25	§103(a) Obviousness	• Thundat, et al. (U.S. Patent No. 6,289,717); and • Thundat (U.S. Patent No. 6,016,686).
9 & 10	§103(a) Obviousness	• Welland, et al. (U.S. Patent Pub. No. 2003 0222232); and • Negersmith (U.S. Patent No. 4,300,906).
11	§103(a) Obviousness	• Furcht, et al. (U.S. Patent No. 6,054,277); and • Polla (U.S. Patent No. 5,536,963).
27 – 32	§103(a) Obviousness	• Welland, et al. (U.S. Patent Pub. No. 2003 0222232); and • Paritsky, et al. (U.S. Patent Pub. No. 2003/0209656).
1, 3, 4, 7, 13, 16, 17 and 26	Nonstatutory obviousness-type double patenting	• Ghislain, et al.(U.S. Patent No. 6,642,517); and • Thundat (U.S. Patent No. 6,016,686).

Applicants have amended claims 1, 2, 5, 8, 13 – 15, 26, and 27 and have provided discussion below for distinguishing the present claims, as amended, from the art cited against them.

35 USC §102(b)

The Examiner rejected Claims 1 – 5, 8, 13 – 18, and 26 as being anticipated under §102(b) by Furcht. Furcht discloses a genetic testing system that uses a cantilever to detect the binding of a specific analyte or specific DNA product to a molecular recognition surface. The change in force detected by the system is due to the sample binding to the cantilever. While both Furcht and these embodiments of the invention disclose methods of using a force transducing sensor such as a cantilever with biological samples, the forces measured by the sensor are different, as are the characteristics of the sample determined by the force measurement. Claims 1, 13, and 26 have been amended to disclose that the motion sensors detects the motion of motile samples and/or specimens. The amended Claims clarify that they are intended to provide a method for measuring the movement of a motile specimen or determining some characteristic of the motile specimen by measuring its movement. Furcht discloses a method of detecting a specific analyte in a sample by providing a molecular recognition surface to which the analyte binds. The binding of the analyte to the surface causes the cantilever to move and the movement is measured as a means of detection. The embodiments disclosed in Claims 1, 13, and 26 use the cantilever to measure the movement of a motile specimen. To the extent that the specimen is bound to the cantilever, the binding serves to allow the cantilever to measure the movement of the specimen during the specimen's residence time on the cantilever, not to provide detection of a particular specimen in the sample. Applicants assert that amended Claims 1, 13, and 26 are allowable over Fucht. Claims 2 – 5 and 8 depend on Claim 1; and Claims 14 – 18 depend on Claim 13, and should also be allowable.

The Examiner rejected claim 26 as being anticipated under §102(b) by Thundat '9717. Thundat '9717 is directed at providing a cantilever with a surface coating that will react with one or more of the components of a given sample. This application of the technology depends on chemical reaction between the coating and the sample to detect the presence of a particular component of that sample. The motion sensor disclosed in Claim 26 does not depend upon chemical reaction of the specimen and the surface coating to measure

the characteristics of the specimen, but rather on a physical interaction between motile specimens and the force transducing sensor. Claim 26 has been amended to specify that motile specimens are interacting with the force transducing sensor to clarify that the force transducing sensor is using the movement of the specimens to measure the characteristics of the specimen, rather than the interaction of the specimens with the surface coating, as in Thundat '9717. Claim 26 should be allowable over Thundat '9717.

The Examiner rejected Claims 1 – 5, 7, 8, 13 – 18, and 21 – 25 as being anticipated under §102(e) by Welland. Welland discloses a tube, through which a fluid flows. Paragraph [0031] in Welland describes the feature pictured in Figure 1:4 as a tube and the arrow seen in Figure 1 indicates the direction of flow through the tube. The chamber disclosed is an enclosure for containing a sample, not a tube that allows the sample to flow through. Claim 1 describes the chamber as "capable of holding a medium wherein the medium includes a sample" and a tube, such as that pictured in Welland, Figure 1, is open on the ends and not capable of holding a sample. Additionally, Welland discloses a method of detecting components in a sample that utilizes a cantilever to detect interaction between the molecules in the sample and a surface coating on the cantilever. This embodiment of the invention measures forces related to the motion of the sample. The forces measured by the cantilever are caused by the movement of the sample, not by the interaction of the sample with the surface coating of the cantilever, as described in Welland (see [0035] and [0036]). Claim 1 has been amended to clarify that the measurement is of the motion of the sample. Claim 1 should thus be allowable over Welland. Claims 2 – 5, 7 and 8 depend on Claim 1 and should also be allowable.

Claim 13 has also been amended to clarify that the device is measuring the movement of the sample itself, rather than movement resulting from interaction between molecules in the sample and the surface coating of the cantilever as disclosed in Welland. The Welland reference does not disclose the use of the device to detect the motion of a motile specimen within the sample. As discussed in paragraphs [0001] and [0005] – [0007] of Welland, the

Welland reference teaches a method of using motion caused by the interaction of molecules in the sample with the surface coating of a cantilever to detect whether such molecules are present in the sample and in what quantities. The sensor described in Claim 13 is intended to detect the motion of the samples, the binding of the sample to the force transducing sensor is another means of detecting the motion of the sample, but is not intended to be a measure of the binding forces. Claim 13 should be allowable over Welland. Claims 14 – 18 depend on Claim 13 and should also be allowable.

In Claims 21 – 25, describe a method for determining the characteristic motile frequency of a multiplicity of motile specimens. Welland teaches a method of detecting analytes in a sample by passing the sample through a tube. The analytes interact with the surface coating on a cantilever in the Welland reference, causing a slight motion in the cantilever. The configuration in Welland is designed for detection of the presence of molecules in a sample and is distinct from the configuration in this embodiment of the invention. In Claim 21, the medium containing the motile specimens is placed into a chamber that contains that medium. The chamber allows the force transducing sensor to measure the motion of the specimens within that portion of medium. This embodiment of the invention allows the motile frequency of the specimens to be detected because the sample is fixed in a chamber, rather than passed through a tube. If the sample were flowing through a tube, such as that disclosed in Welland, the movement of the cantilever would measure the presence of motile specimens, but would not isolate the frequency of the movement of the specimens from the movement caused by the flow through the tube. The chamber "adapted to receive for analysis a medium having therein a multiplicity of motile specimens" is a critical structural element to detection of motile frequency. Claim 21 should be allowable over Welland. Claims 22 – 25 depend on Claim 21 and should also be allowable.

For these reasons, and based on the amendments to the claims, Applicants respectfully request that the 35 U.S.C. §102 rejection be withdrawn from the application.

35 USC §103(a)

The Examiner also rejected Claims 1 – 8 and 12 - 25 as obvious under §103(a) over Thundat '9717) in view of Thundat '6686. The Thundat '9717 reference discloses a motion sensor comprising at least one force transducing sensor provided in the form of a microcantilever positioned to interact with a specimen in a fluid sample, including biological samples. However, Thundat '9717 does not teach the use of the force transducing sensor to detect the movement of motile specimens, but rather the movement caused by the force of the specimen reacting with a surface coating on the cantilever or by the force of the specimen binding to the cantilever. This embodiment of the invention depends on the movement of a motile specimen to provide the force detected by the system. The Thundat '6686 reference does disclose the use of live biological specimens with the microcantilever sensor, but depends on differences is surface charge to provide the force that is measured by the sensor. Neither Thundat reference discloses a system that uses the movement of the specimens to provide a dynamic force that is measured by the sensor. The surface coatings disclosed in both Thundat references take advantage of chemical reaction and surface charge to allow for detection of the desired parameters. The amendments to Claims 1 and 13 incorporate the requirement that these embodiments of the invention be used to determine characteristics of motile specimens to clarify that the physical features of the motion sensor be used with motile specimens and be capable of measuring the movement of those specimens. Claim 21 was already directed to a motion sensor for use with motile cells. This embodiment of the invention does not rely on the surface coatings to bind, react, or create a difference in surface charge with the specimens to move the cantilever and neither reference in Thundat suggests that the movement of the cantilever could be accomplished by the cells themselves. While it might be obvious to combine the teachings of the two Thundat references, the combination of the two does not teach the inventive principles disclosed in the herein. Claims 1, 13, and 21 should be allowable over Thundat '9717 in view of Thundat '6686. Claims 2 – 8, 12 and 20 depend on Claim 1; Claims 14 – 19 depend on Claim 13; and Claims 22 – 25 depend on Claim 21 and should also be allowable.

The Examiner rejected Claims 9 and 10 as obvious under §103(a) over Welland in view of Negersmith. Claims 9 and 10 have been cancelled.

The Examiner rejected Claim 11 as obvious under §103(a) over Furcht in view of Polla. The Examiner points out that Polla discloses a plurality of microcantilevers that in one embodiment form a ribbon structure. While Furcht and Polla both disclose uses of microcantilevers, the combination of the ribbon structure in Polla with the Furcht reference does not make the embodiment of the invention in Claim 11 obvious. As discussed in the response to the Examiner's rejection of Claims as being anticipated by Furcht, the Furcht reference discloses a genetic testing system that uses a cantilever to detect the binding of a specific analyte or specific DNA product to a molecular recognition surface. The change in force detected by the system is due to the sample binding to the cantilever. Claim 1, on which Claim 12 depends, has been amended to disclose that the motion sensor detects the motion of motile samples and/or specimens. The amended Claims clarify that they are intended to provide a method for measuring the movement of a motile specimen or determining some characteristic of the motile specimen by measuring its movement. Furcht discloses a method of detecting a specific analyte in a sample by providing a molecular recognition surface to which the analyte binds. The binding of the analyte to the surface causes the cantilever to move and the movement is measured as a means of detection. As Furcht does not disclose the motion sensor set forth in Claim 1, Claim 11 is not obvious when Furcht is combined with Polla.

The Examiner rejected Claims 27 - 32 as obvious under §103(a) over Welland in view of Paritsky. The Examiner points out that Paritsky discloses an optical detection mechanism that contains the transparent substrate with at least one lens that is disclosed in Claim 27 that was not present in the Welland reference. While Welland and Paritsky both disclose uses of microcantilevers, the combination of the optical detection system in Paritsky with the Welland reference does not make the embodiments of the invention in Claims 27 - 32 obvious. As discussed in the response to the Examiner's rejection of Claims as being

anticipated by Welland, the Welland reference discloses a tube, through which a fluid flows. Claim 27, on which Claims 28 – 32 depend has been amended to disclose a chamber for containing a sample, distinguishing the Claims from the disclosure in Welland of a tube that allows the sample to flow through. Claim 1 describes the chamber as "capable of holding a medium wherein the medium includes a sample" and a tube, such as that pictured in Welland, Figure 1, is open on the ends and not capable of holding a sample. Additionally, Welland discloses a method of detecting components in a sample that utilizes a cantilever to detect interaction between the molecules in the sample and a surface coating on the cantilever. This embodiment of the invention measures forces related to the motion of the sample. The forces measured by the cantilever are caused by the movement of the sample, not by the interaction of the sample with the surface coating of the cantilever, as described in Welland (see [0035] and [0036]). Claim 27 has been amended accordingly to reflect the fact that the samples under analysis are motile samples in keeping with the rest of the Claims in the application. As Welland does not disclose the motion sensor claimed in Claim 27, Claim 27 is not obvious when Welland is combined with Paritsky. Claim 1 should thus be allowable over Welland. Claims 2 – 5, 7 and 8 depend on Claim 1 and should also be allowable. Claims 28 – 32 depend on Claim 27 and should also be allowable.

Double Patenting

The Examiner rejected Claims 1, 3, 4, 7, 13, 16, 17 and 26 on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1, 12 – 15 and 22 of Ghislain (U.S. Patent No. 6,642,517) in view of Thundat '6686. As no common ownership appears to exist between the prior art referenced in the Examiner's double-patenting rejection and the present application, Applicants treat this rejection as being based on 35 U.S.C. §103(a) instead.

As the Examiner explains, Thundat '6686 discloses a motion sensing device capable of detecting the presence of cells through "detecting and measuring changes in the presence

of certain physical and chemical parameters within the sample solution, such as hydrogen ion concentration." The embodiments of the present invention disclosed in independent Claims 1, 13, and 26, on which dependant Claims 3, 4, 7, and 16 depend, teach a motion sensor capable of detecting and/or measuring the characteristics of a motile sample and/or specimen by using contact with the cantilever or cantilevers to measure the movement of the sample and/or specimen. The use of chambers in biological analytical procedures to contain fluids may be obvious, however, the use of microcantilever technology to measure the movement of a motile sample of specimen is a novel idea not disclosed in Thundat '6686.

The Thundat '6686 reference is directed at providing a cantilever with a surface coating that will react with one or more of the components of a given sample. This application of the technology depends on chemical reaction between the coating and the sample to detect the presence of a particular component of that sample. The motion sensors disclosed in Claims 1, 13, and 26 do not depend upon chemical reaction of the specimen and the surface coating to measure the characteristics of the specimen, but rather on a physical interaction between motile specimens and the force transducing sensor. These claims have been amended to specify that motile specimens are interacting with the force transducing sensor to clarify that the force transducing sensor is using the movement of the specimens to measure the characteristics of the specimen, rather than the interaction of the specimens with the surface coating, as in the Thundat '6686 reference. Claims 1, 13, and 26 should be allowable over U.S. Patent No. 6, 642,517 in view of Thundat '6686. Claims 3, 4, and 7 depend on Claim 1; and Claim 16 depends on Claim 13. The dependant claims should also be allowable.

Conclusion

Inasmuch as each of the objections have been overcome by the amendments and discussion above, and all of the Examiner's suggestions and requirements have been satisfied, it is respectfully requested that the present application be reconsidered, the rejections be withdrawn and that a timely Notice of Allowance be issued in this case.

Any shortages of fees due may be charged to, and any overpayments may be credited to, deposit account no. 50-1519.

Respectfully submitted,

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